CP-300 & TW-12
Belt-Pack & Interface
Two-Wire System

INSTRUCTION
and
SERVICE MANUAL

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CLEAR-COM CP-300 BELTPACK STATION
& TW-12 TWO-WIRE INTERFACE UNIT
OPERATION & SERVICE MANUAL

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CLEAR-COM CP-300 BELT-PACK
Operation & Service Manual

ADDENDA

CP-300 "Call" Signalling
(replaces "Optional Signalling" section of Introduction to the Belt-Pack; page 1, column 2)

The signalling option for the CP-300 provides a visual alert for users who aren't listening to the intercom. Pressing the CP-300's CALL button sends a special call-signalling voltage (either a 20 kHz tone or a positive DC voltage) onto the intercom channel currently in use. This voltage is detected by all other stations which are switched to that channel, causing their call lights to turn on.

The 2-channel/1-channel mode-select switch sets the signalling method: a tone for 2-channel or "TW" operation, or DC voltage for single channel (standard Clear-Com) use.

The signalling option requires installation of a switch/light button and an additional PC assembly.

Headsets
(see System Installation, page 3)
The headset used with the CP-300 should have a rated mic output level of **-55 dBv.**

CP-300 as a two-wire /two-channel station
(see System Installation, page 4)
Using the CP-300 as a two-channel station requires connection to a TW-12 Interface Unit OR connection to an existing "TW" (two-wire) two-channel intercom system. The CP-300's side panel contains a recessed "mode-select" switch, which must be set to the "2-CH MODE" position (refer to **Figure** 2 for switch location).

CLEAR-COM CP-300 BELT-PACK STATION & TW-12 INTERFACE UNIT
OPERATION MANUAL

I. INTRODUCTION TO THE BELT-PACK & INTERFACE

The Clear-Com CP-300 is a portable belt-pack intercom that allows communication on two channels, using standard two-conductor microphone cable. The CP-300 is different from other Clear-Com Stations because it requires connection to an interface unit, Model TW-12, to utilize its full capabilities.

When the CP-300 is used in its two-channel/two-wire mode, two audio channels are transmitted on one cable: channel A audio and DC power on one of the wires, channel B audio on the other wire. The System must include the TW-12 Interface when two intercom channels are required on one cable. (Clear-Com typically uses one cable to support one audio channel plus power, or it uses multi-pair cable for two or more channels.)

The CP-300 features Clear-Com's excellent speech intelligibility in all high- and low-noise environments. It also includes a mic limiter, which holds the output relatively constant over a 30 dB input range. The CP-300 has the same pin-to-pin connections and functions as RTS intercoms (e.g., RTS Model BP-300), with **better** performance.

A unique CP-300 feature is its switch-selectable operation as a two-channel/two-wire station or as a "standard" one-channel Clear-Com station. It operates in a stand-alone, two-channel system or combined in a system with standard Clear-Com Stations. Refer to the system diagrams, page 3.

Other CP-300 features include its "user-friendly" control lay-out, including the rocker switch for channel-selection (A or B), a three-position mic switch (on/off/momentary on), and a low-profile volume control. The controls are different sizes to facilitate adjustment by touch only. All controls are protected by the raised lip of the belt-pack's chassis.

Optional Signalling

The Visual Signalling function, a typical Clear-Com feature, is configured differently in the CP-300 than it is in standard Clear-Com Stations.

The CP-300 uses a 20,000 Hz signal, transmitting it on the audio channel selected for communicating (A or B). This signal is detected by the other CP-300's which are using that same channel (A or B), causing the CP-300 call lamps to light up. When the signalling option is included in the CP-300, a call lamp/button is added to the belt-pack's chassis. The system of signalling is determined by the one-channel/two-channel mode switch on the CP-300 operation; it switches the signalling circuitry from DC mode (standard Clear-Com) to the 20k Hz signal used in the "TW" system.

The CP-300's headset amplifier provides power to drive a standard Clear-Com headset to levels greater than 110 dB SPL, without any distortion. The belt-pack operates with either a dynamic or a carbon headset, providing an input connector for each one.

The CP-300 also incorporates "automatic headset detection," which mutes the mic pre-amp when the headset is not plugged in. Therefore an unused yet on-line belt-pack doesn't cause background noise.

(continued)

The belt-pack provides a sidetone adjustment, which allows the user to vary the level of his/her voice (full on to 25 dB null) as heard in the headset. This control need be set just once, if at all, even if other intercom stations join or leave the intercom network.

TW-12

The TW-12 Interface connects between the CP-300 Belt-Pack(s) and a standard Clear-Com Power Supply or Main Station. Its function is to translate audio line levels and call signalling, and to modulate one of the two audio channels onto the DC power line. The TW-12, which is in a space-saving rack-mount chassis (1.75" high), contains no operational controls except for a Mode-Select toggle switch.

The TW-12 translates levels and voltages from two separate Clear-Com channels, and provides the two-wire, two-channel output on mic cable. An auto-termination feature prevents oscillation in partially-connected systems. The TW-12, which typically receives its power through the connection to Clear-Com, translates the visual call signalling between the two systems (tone to DC & vice versa).

The TW-12 can also be used to link the Clear-Com System with a two-wire, two-channel intercom system (e.g. RTS's "TW" System). The Interface supports RTS BP-300 belt-packs as well as Clear-Com's CP-300 belt-packs.

When the TW-12 is used to link a Clear-Com System with a two-wire two-channel system, the number of intercom stations that may be contained within both systems is only limited by the capacity of the power supplies in the respective systems.

The ability of the TW-12 to support intercom stations is only limited when it functions as support for a stand-alone two-wire, two-channel system. The TW-12 supports up to ten (10) two-channel/two-wire intercom stations with signalling or up to 16 such intercoms without the signalling function (Clear-Com CP-300, RTS BP-300, or equivalent).

The TW-12, once set up, is transparent to the intercom users. Its one control is a toggle switch that selects between internal termination (for "TW" belt-packs) or external termination (for interfacing with an RTS-type power supply).

II. SYSTEM INSTALLATION

Headsets

The CP-300's dynamic headset input is a 4-pin, male XLR.

To insure proper level and performance, the dynamic headset (or handset) should have the following characteristics--

Mic Impedance:	150-250 ohms
Mic Output Level:	-55 dB
Ear Element Impedance:	50-2000 ohms

The dynamic headset connector pin-out is:

Pin 1:	mic common
Pin 2:	mic hot
Pin 3:	headphone common
Pin 4:	headphone hot

NOTE: Do NOT connect headphone ground and mic ground together at any point.

The CP-300 also accepts a standard carbon mic headset, and provides a 1/4" phone jack for the input. The carbon headset should contain a 50 ohm carbon-type microphone, a 600-1000 ohm earpiece, and the cord should be terminated in a 1/4", 3-conductor (ring/tip/sleeve) phone plug.

The carbon headset connections are:

Tip:	mic hot
Ring:	headphone hot
Sleeve:	ground

Interconnect Cable

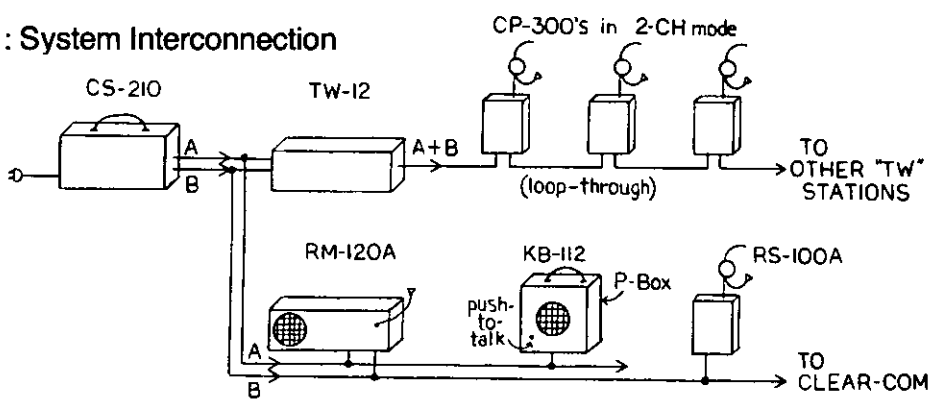
Use standard 2-conductor microphone cable to interconnect the CP-300 with other belt-packs or the TW-12. You can use unshielded cable where AC interference is not a problem.

We recommend rubber-insulated and jacketed cable, such as:
Belden 8413 or equivalent (24 ga., stranded conductors) for lines running up to 500 feet in length;

Belden 8412 or equivalent (20 ga., stranded conductors) for lines running 500-5000 feet in length;

Belden 8428 or equivalent (18 ga., low-capacity) for lines greater than 5000 feet in length.

FIGURE 1: System Interconnection



Typical mixed standard and "TW" two-channel system (portable)

The CP-300 as a Single-Channel Station

First be sure that the recessed two-position switch on the belt-pack's side is set to the **"SINGLE CH MODE (select B)"** position (see Figure 1 for location of mode-select switch).

Second, the CP-300 operator must communicate on **Channel B** when using the single-channel mode; **be sure that the CP-300 Channel-Select switch is set to the "B" position.**

Bring mic cable from the Clear-Com Main Station or Power Supply and plug it into the D3F connector labelled "input" on the CP-300. The pin-out is--

Pin 1: Common
Pin 2: +VDC
Pin 3: Intercom Audio

After completing all connections, plug in the headset and turn up the volume. The Station is now ready to operate.

The CP-300 as A Two-Wire/Two-Channel Station

This mode requires the TW-12 to support the CP-300. First be sure that the CP-300 mode-select switch is set to the **"2-CH MODE"** position (see Figure 1 for location). In this mode, the pin-out assignment for the CP-300 input and extension connectors is--

Pin 1: Common
Pin 2: +VDC and Channel A Audio
Pin 3: Channel B Audio

The INPUT to the CP-300 MUST come from the TW-12 output connector (3-pin male XLR) labelled "System Interface."

In this mode, the TW-12 must be connected to two standard Clear-Com channels via the interface's two input connectors, one for Clear-Com channel A and one for Clear-Com channel B.

After completing all connections, plug in the headset and turn up the volume. The Station is now ready to operate.

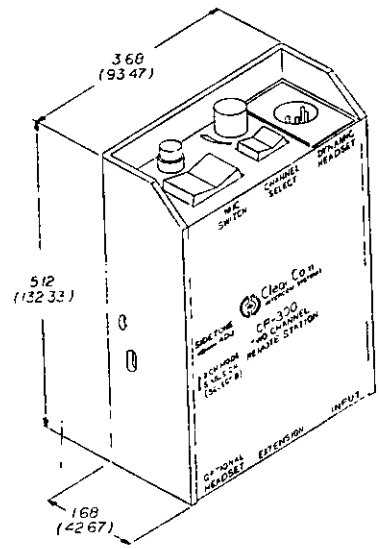


Figure 2: CP-300 Belt-Pack

TW-12 Set-Up

The TW-12 provides two male and two female 3-pin, XLR connectors for input and extension of Clear-Com channels A and B, plus a third set of XLR connectors for use with the two-channel/two-wire end of the system. For all connections, use standard two-conductor shielded mic cable. See Figure 3. The TW-12 rear panel pin-out assignments are:

Clear-Com System Connectors:		System Interface Connectors:	
Pin 1:	Common	Pin 1:	Common
Pin 2:	+VDC	Pin 2:	+VDC and Ch A Audio
Pin 3:	Intercom Audio (Ch A or B)	Pin 3:	Ch B Audio

The TW-12, once set up, is transparent to the user. It has only one control on the front panel: a toggle switch that selects between the internal or external termination mode.

Set this switch to the "2-Channel Station" position to support TW-type belt-packs (internal termination); or set it to the "System Interface" position for interfacing the Clear-Com System with a TW-type system that includes its own power supply (external termination).

CP-300 Loop-Through Interconnection

Regardless of its operation mode, the CP-300 has a 3-pin male connector labelled "extension" to provide an internal loop-through. This allows you to daisy-chain CP-300's or similar stations along one stretch of cable. All stations using the loop-through MUST be in the same operation mode (one channel or two-channel).

NOTE: To prevent shock hazard, ground loops, and noises, NEVER connect Pin 1 (common) directly to the station chassis. In addition, never connect Pin 1 to the shell of the mic cable.

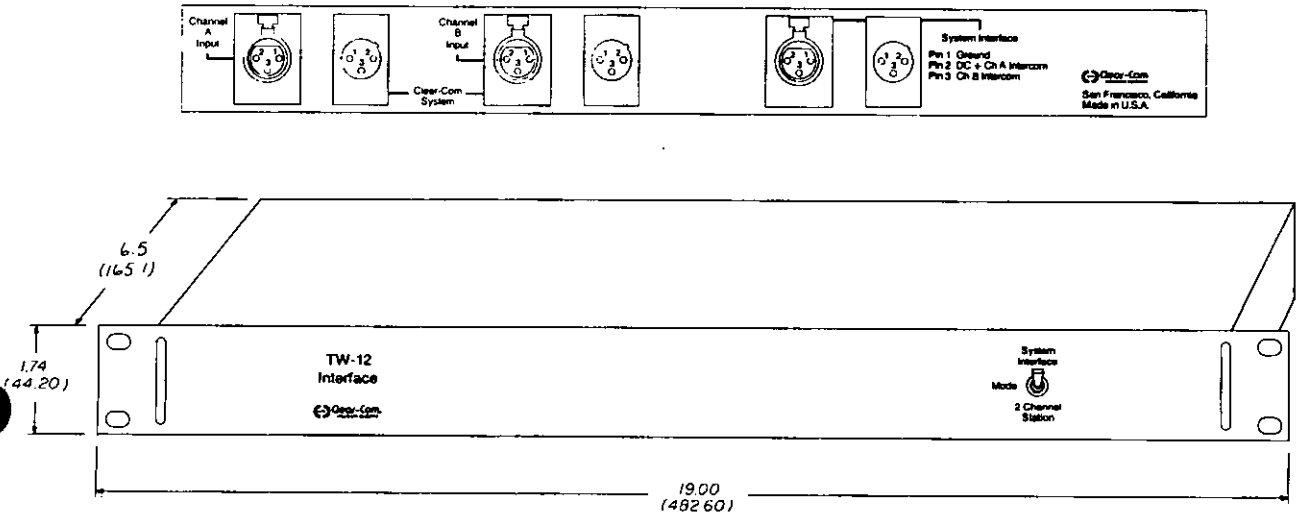


Figure 3: TW-12 Interface

III. CP-300 OPERATING CONTROLS

The **MIC SWITCH** turns the headset mic ON and OFF, and includes a third position marked **"on (mom)"** (momentary on) for quick messages.

The **CHANNEL-SELECT SWITCH** allows:
1) communication on Channel A or on Channel B, when the CP-300 uses the 2-Channel mode, OR
2) communication on one channel (B) when the CP-300 uses the Single-Channel mode.

Note that the Channel-Select Switch must be set to "B" when the CP-300 operator is using the standard Clear-Com single-channel mode.

The **VOLUME** knob adjusts the audio level in your earphone(s).

The **SIDETONE** adjustment is located on the side of the belt-pack, and is used to vary the amount of your voice as heard in your headset. It does not affect the level of incoming or outgoing signals, and is set at the factory to be approximately 6 dB lower than incoming signals. To re-set it, locate the unmarked hole (which contains a trimpot). Plug in your headset, insert a small-bladed screwdriver through the hole, and engage the slot on the trimpot. Turn up the headset volume all the way, and start talking to yourself while slowly turning the screwdriver. A null point will be found where you can barely hear yourself; the normal setting is anywhere to the left of the null.

The optional **VISUAL CALL SIGNALLING** function follows the setting of the belt-pack's Channel-Select switch; for instance, if you are talking on channel A, pressing the Call switch will illuminate the lights at all other Stations communicating on channel A. Call lights will stay on for as long as the switch is depressed. The **CALL LIGHT** lights up to attract your attention when another Station operator (using the same channel) activates the Call signal.

IV. PARTS LISTING

CP-300 Belt-Pack Without Signal Option

part #	description	qty.
150048	capacitor, 100pF 1kv 20% RF	1
210002	input connector, 3-pin female XLR	1
210003	output connector, 3-pin male XLR	1
210013	dynamic headset input, 4-pin male XLR	1
210050	carbon headset input, 1/4" phone jack	1
240031	volume control knob	1
250041	large belt-clip	1
250233	CP-300 chassis	1
250234	CP-300 chassis cover	1
640007	hole plug	1
710152	CP-300 printed circuit board assembly	1

CP-300 Belt-Pack With Signal Option

same as above EXCEPT: delete part #640007, hole plug and add:

510064	Call switch with lamp	1
710153	CP-300 signalling circuit board assy.	1

TW-12 Two-Wire Interface

210002	input connector, 3-pin female XLR	3
210003	output connector, 3-pin male XLR	3
240017	rack handles for 1.75" chassis	2
250073	1.75" mainframe chassis	1
250152	mainframe chassis cover	1
250231	two-wire interface front panel	1
250232	two-wire interface rear panel	1
510006	mini-toggle switch, 2-position	1
710147	two-wire interface printed circuit asy.	1

V. CP-300 SPECIFICATIONS

AMPLIFIER DESIGN: Solid-state, low-noise I.C. amps; current-limited and short-circuit-protected, with reverse polarity protection.

MICROPHONE PRE-AMPLIFIER

Mic Input Impedance:	1k ohm
Mic Pre-amp Gain:	50 dB
Max Input Before Clipping:	-32 dB
Freq. Response:	250-12k Hz, ±5dB
Carbon Mic Current:	10 ma nominal
Limiter Range:	8 dB change in output for 30 dB change in input

HEADPHONE AMPLIFIER

Load Impedance Range:	50-2k ohms
Output Level:	+15 dBm into 300 ohm load
Headset Level:	>110 dB SPL (with dynamic Clear-Com headset)
Distortion:	<0.1% THD @ 1 kHz
Amplifier Gain:	24 dB
Freq. Response:	150-12k Hz, ±2dB

CONNECTORS

Headset:	(1) 4-pin male, D4M & (1) 1/4", 3-cond. phone jack
Line:	two 3-pin XLR, 1 male and 1 female for loop-through

GENERAL

Station Bridging Impedance:	>20k ohms (200-10k Hz)
Avg. Line Level:	-6 dB, +3 dB max
Sidetone Adjust:	25 dB null-full on
Call Light Sensitivity:	(receive) 4 volts DC (send) 11VDC
Power Requirements:	25 ma quiescent
DC Voltage Range:	12-32v @ 25ma average, 25v nominal
Max. Number of CP-300s with TW-12:	without signalling, 16 with signalling, 10

PHYSICAL CHARACTERISTICS

Dimensions:	3.78" x 5.1" x 1.6"
Weight:	14.5 oz (without signal circuit)
Ambient Operating Temperature:	0-60° C (32-140° F)
Humidity:	0-90% relative humidity

VI. TW-12 SPECIFICATIONS

LINE CHARACTERISTICS, CLEAR-COM SIDE

Level:	-15 dBv nominal, 0 dBv max before clipping
Impedance:	200 ohm AC termination 5000 ohm DC termination

LINE CHARACTERISTICS, TW SIDE

Level:	-5 dBv nominal, +3dBv max
Impedance:	200 ohm AC

GENERAL CHARACTERISTICS

Gain, Clear-Com-to-TW:	+12 dB
Gain, TW-to-Clear-Com:	-12 dB
Freq. Response:	200-10k Hz, ±3 dB
Power Requirements:	12-32 VDC, 50ma quiescent plus current for TW side
TW Power Capacity:	500ma max (6-12 stations)

SIGNALLING, TW SIDE

Frequency:	20k Hz
Freq. Tolerance:	±100 Hz send, ±500 Hz receive
Tone Level:	-6dBv minimum send, -30dBv maximum receive

SIGNALLING, CLEAR-COM SIDE

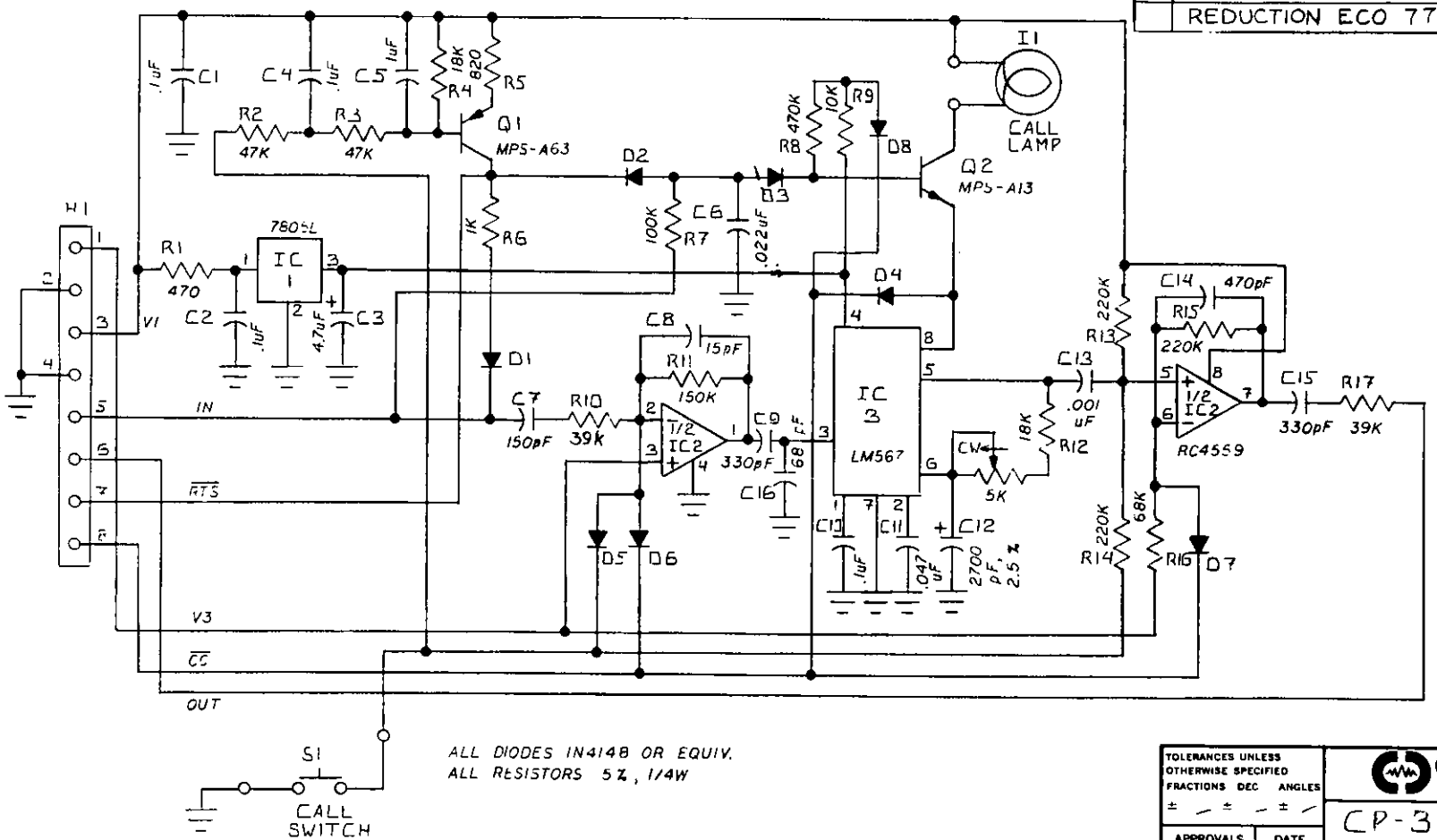
4 VDC maximum receive, 11 VDC minimum send

DIMENSIONS

1.75" H x 19" W x 6" D
44mm H x 483mm W x 152mm D

0 dBv is referenced to 0.775 volts RMS

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
99	PROTO	2/1/84	
A	PROD REL ECO 638	5/9/84	
B	SIGNALLING SENSITIVITY		
	REDUCTION ECO 771	4/25/85	



ALL DIODES IN4148 OR EQUIV.
ALL RESISTORS 5%, 1/4W

TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS DEC ANGLES	
± _ ± _ ± ′	
APPROVALS	DATE
DRAWN CEL	1/1/84
CHECKED	

Clear-Com. intercom systems

CP-300 SIGNALLING PCB ASY

SCALE	SIZE	DRAWING NO.
X	B	710153-SCD-B

DO NOT SCALE DRAWING — SHEET 1 OF 1

CHANNEL B

CHANNEL A

ASY 710147

SYSTEM INTERFACE

2 CHAN STATION MODE

CHAN B

CHAN A

CLEAR-COM SYSTEM

SYSTEM INTERFACE

UNLESS OTHERWISE NOTED:
ALL RESISTORS VALUED IN OHMS, ±5%, ¼W.
ALL CAPACITORS VALUED IN MICROFARADS.
ALL DIODES IN4148.

C L'ST	
NUMBER	TYPE
1,2,3,4,5,6	RC4558
7	LM567
8,14	CD4070B
9	LM301
10	7805

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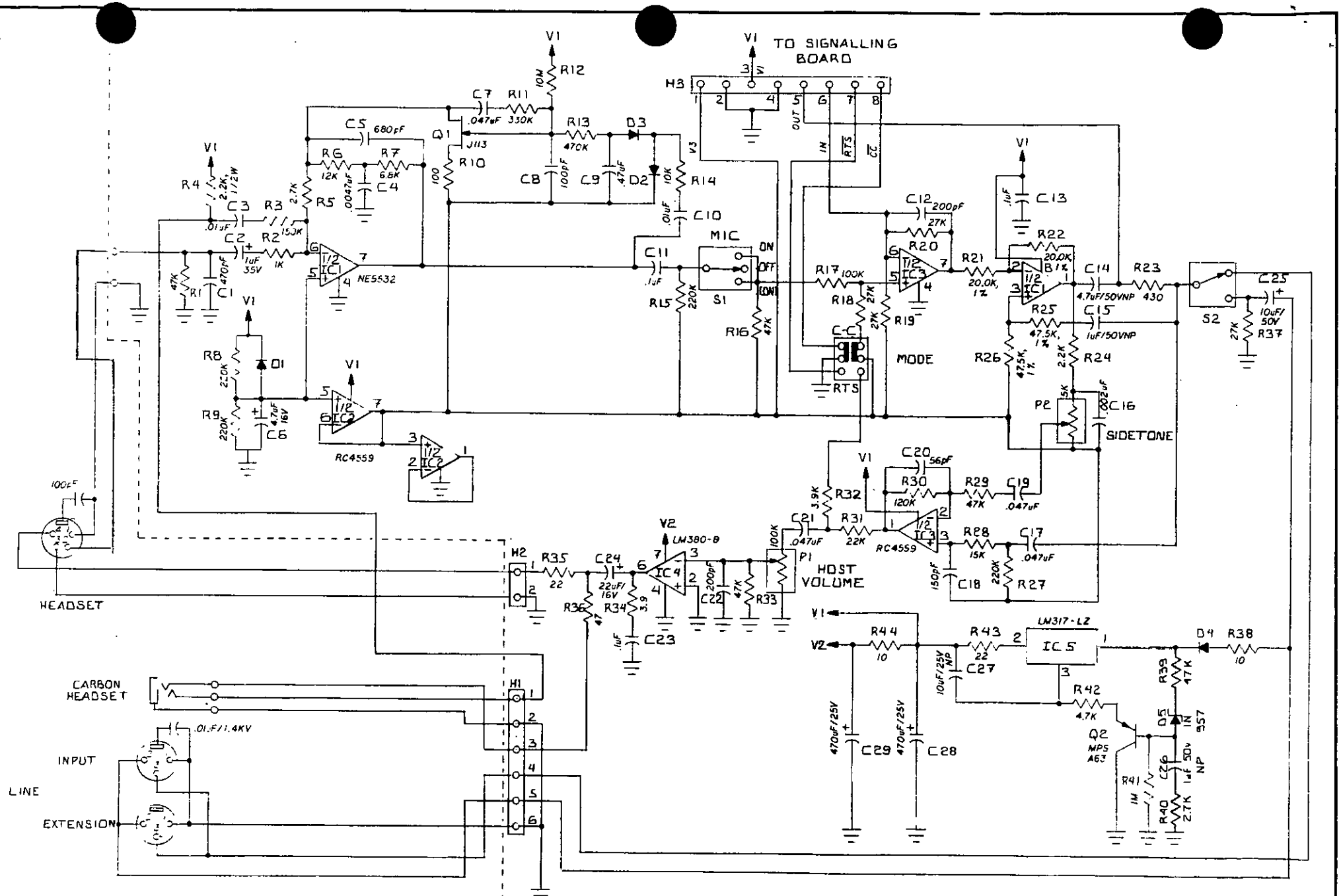
TW TO CLEARCOM ADAPTOR, TW-12

SCALE: — SIZE: D DRAWING NO: TW-12-SSD D-A

DO NOT SCALE DRAWING SHEET 1 of 1



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CP-300 PCB ASSEMBLY

SCALE	SIZE	DRAWING NO.
X	C	710152-SCD-C-C
DO NOT SCALE DRAWING		SHEET 1 OF 1

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